SN 10/760,541

AU96506

(12) PATENT ABRIDGMENT (11) Document No. AU-B-50610/96
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 699301

(54) Title
MANUFACTURING OF BIMETAL GRINDING RINGS

International Patent Classification(s)
(51)[6] B02C 017/22 C22C 029/06 C22C 038/00 C22C 038/04
C22C 038/08 C22C 038/12 C22C 038/18 C22C 038/20
C22C 038/22 C22C 038/40 C22C 038/42 C22C 038/44

(21) Application No. : 50610/96 (22) Application Date : 12.04.96

(30) Priority Data

(31) Number	(32) Date	(33) Country
PN2446	13.04.95	AU AUSTRALIA

(43) Publication Date : 24.10.96

(44) Publication Date of Accepted Application : 26.11.98

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(56) Prior Art Documents
US 5079819
DE 3824428
SU 1636048

(57) Claim

1. A bimetal grinding ring which includes a base casting material which is made of a first metal composition and includes a recess and a hardfacing layer made of a second metal composition which is arcuate in shape and is located in the recess, the hardfacing layer being rebuildable over the service life of the grinding ring.

2. A bimetal grinding ring in accordance with claim 1, wherein the base casting material is made of cast white iron material.

4. A bimetal grinding ring in accordance with claim 2 or 3, wherein the cast white iron material has a composition which includes:

(a) 2.3 to 3.0 percent by weight carbon;

(b) 0 to 1.0 percent by weight silicon;

(c) 0.5 to 1.5 percent by weight manganese;

(d) 23 to 30 percent by weight chromium;

(e) 0 to 1.2 percent by weight copper;

(f) 0 to 1.5 percent by weight molybdenum; and

(g) 0 to 1.0 percent by weight nickel.

5. A bimetal grinding ring in accordance with claim 1, wherein the base casting material is made of cast steel material.

9. A bimetal grinding ring in accordance with any one of the preceding claims, wherein the hardfacing layer has a composition that includes:

(a) 14 to 35 percent by weight chromium;
(b) 1.8 to 7.5 percent by weight carbon;
(c) 0 to 4 percent by weight manganese;
(d) 0 to 1.5 percent by weight silicon; and
the balance being iron.

13. A method of production of a bimetal grinding ring wherein a first metal composition is cast into a base shape forming a base cast including a recess and subsequently a hardfacing layer made of a second metal composition which is arcuate in shape is applied to the recess, the hardfacing layer of the grinding ring being rebuildable over the service life of the grinding ring.

14. A method of production of a bimetal grinding ring in accordance with claim 13, wherein the hardfacing layer is applied and reapplied, when necessary, to the base casting by way of welding.

PATENTS ACT 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT
(Original)

APPLICATION NO:
LODGED:

COMPLETE SPECIFICATION LODGED:
ACCEPTED:
PUBLISHED:

RELATED ART:

NAME OF APPLICANT: ASHFIELD HOLDINGS PTY LTD &
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INVENTION TITLE: "MANUFACTURING OF BIMETAL GRINDING RINGS"

DETAILS OF ASSOCIATED PROVISIONAL APPLICATION NO'S:

PN2446
Filed April 13, 1995

The following Statement is a full description of this invention including the best method of performing it known to me/us:

ABSTRACT

The present invention relates to a bimetal grinding ring (10,12) which includes a base casting material (14,16) which is made of a first metal composition and includes a recess (18,20) and a hardfacing layer (22,24) made of a second metal composition which is located in the recess, wherein a material is grinded substantially in the recess (18,20) which is reinforced by the hardfacing layer (22,24), the hardfacing layer (22,24) being rebuildable over the service life of the grinding ring (10,12).

The present invention also relates to a method of production of a bimetal grinding ring (10,12).

The present invention relates to an apparatus and method for grinding coal, ores and other materials.

The grinding of coal, ores and other materials involve the use of large pulverising balls which crush coal and similar materials into fine particulate matter. These large pulverising balls crush coal ores and other materials against grinding rings which are subject to stresses and high abrasion. The grinding rings have only a limited service life because of these stresses and high abrasion.

The present invention seeks to alleviate at least some problems of the prior art.

In accordance with one aspect of the present invention, there is provided a bimetal grinding ring which includes a base casting material which is made of a first metal composition and includes a recess and a hardfacing layer made of a second metal composition which is arcuate in shape and is located in the recess, the hardfacing layer being rebuildable over the service life of the grinding ring.

In accordance with a further aspect of the invention there is also provided a method of production of a bimetal grinding ring wherein a first metal composition is cast into a base shape forming a base cast including a recess and subsequently a hardfacing layer made of a second metal composition which is arcuate in shape is applied to the recess, the hardfacing layer of the grinding ring being rebuildable over the service life of the grinding ring.

The apparatus and method of the present invention will now be described by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a sectional side view of a top and bottom bimetal grinding ring; and

Figure 2 is a schematic view of the hardfacing equipment used in the production of the bimetal grinding ring shown in Figure 1.

In Figure 1, there is shown a top grinding ring 10 and a bottom grinding ring 12 in accordance with the present invention. The top grinding ring 10 and bottom grinding ring 12 include a base casting 14 and 16 respectively. The base castings 14 and 16 are made of a first metal composition. The metal bases 14 and 16 both have recesses 18 and 20 as

shown in Figure 1. An arcuately shaped hardfacing layer 22 and 24 made of a second metal composition is applied to the recesses 18 and 20 respectively by welding.

The method of production of the bimetal grinding ring will now be described with reference to Figure 2. This method is a preferred embodiment only and the invention is not restricted to the particular method described herein.

The welding equipment 26 includes a weld head positioner 34 attached to a wire feeder 32 which is further attached to a welding head 33. The weld head positioner 34 is controlled by a weld head positioner control device 36. A welding and wire feed control device 30 is attached to and controls the wire feeder 32 and welding head 33. A welding power supply 28 is further attached to the welding and wire feed control device 30.

A rotating jig 42 is rotatably mounted on a rotator 44 which is attached to a rotator control device 38. The casting 14 is positioned on the rotating jig 42.

The hardfacing layers 22 and 24 are applied onto the base casting 14 as follows.

The hardfacing wire is fed into the wire feeder 32. The welding equipment 26 is automated and applies the hardfacing layers 22 and 24 onto the base metal casting 14.

The rotator 44 rotates the rotating jig 42 such that the hardfacing layer is applied to the base metal casting 14 by decreasing or increasing circles of the second metal composition.

The weld head position 34 is controlled by the weld head positioner control device 36 so that the wire feeder 32 initially starts from the outer edge of the recesses 18 and 20 and moves towards the centre of the recesses 18 and 20 or vice versa. The welding equipment is automated such that the hardfacing layers 22 and 24 are arcuate in shape.

The resulting bimetal grinding ring also provides the advantage that it is also rebuildable. The bimetal grinding rings do not need to be replaced as a whole but rather, once the hardfacing layers 22 and 24 have worn down to an unsuitable depth, the hardfacing layers 22 and 24 are rebuilt by way of the method as described herein.

A rust preventative coating may also be applied to the hardfacing layer.

The base may be made of a rigid material such as cast iron material having the following features. All percentages hereinafter are by weight unless otherwise indicated.

A cast white iron with a hardness of 200-600 HB.The white iron prefereably generally conforms with AS 2027 1985 grade Cr 27 and preferably has a composition falling within the following ranges:

Carbon	2.3 to 3.0 %
Silicon	0 to 1.0 %
Manganese	0.5 to 1.5 %
Chromium	23 to 30 %
Copper	0 to 1.2 %
Molybdenum	0 to 1.5 %
Nickel	0 to 1.0 %

Incidental Impurities

The base materials may be made of a cast steel material having the following features. A cast steel heat treated to withstand gouging and high stress and having a hardness of 200-450 HB. The cast steel preferably has a composition falling within the following ranges:

Carbon	0.25 to 2.0 %
Manganese	0.4 to 1.8 %
Chromium	0 to 2.0 %
Molybdenum	0 to 0.5 %
Silicon	0.15 to 0.8 %
Nickel	0 to 2.5 %
Sulfur	less than 0.04 %
Phosphorus	less than 0.03 %

May also contain Vanadium, Titanium, Tungsten.

Incidental Impurities.

The cast steel preferably also has the following characteristics.

Tensile strength	At least 400 megapascals
Elongation	A minimum of 5 %

Impact strength At least 15 Joules

The hardfacing composition may be made of a weld material having the following features.

The hardfacing composition is typically a metal alloy which is in the form of a flux cored wire for welding. This composition preferably generally conforms with AS 2576-1982.

The alloy preferably has a composition within the following ranges.

- Chromium 14 to 35 %
- Carbon 1.8 to 7.5 %
- Manganese 0 to 4 %
- Silicon 0 to 1.5 %

Microstructure
- Primary Chromium Carbides Volume Fraction 50-75%
- Eutectic/Secondary Carbides 20-30%

This alloy is particularly successful in applications involving gouging and high stress abrasion in heavy industry.

The hardfacing composition may also contain Niobium, Vanadium, Titanium, Tungsten, Tungsten Carbide Granules or Molybdenum together with incidental impurities.

A table illustrating the advantages of the above composition are set out below.

Example

The present invention will now be illustrated by the following example of a simple hard facing composition. The composition has the following components.

Carbon 6.00 %

Mechanical Data

Abrasion Resistance	Excellent
Impact Resistance	Moderate
Deposit Efficiency	90%
Hardness	66 HRc
Machineability	Grinding only
Oxy Acetylene Cutting	Not possible

In use, the grinding of materials such as coal, ores and other materials is achieved by way of large pulverising balls which crush the material against the hardfacing layers 22 and 24, respectively, of grinding rings 10 and 12 respectively. The hardfacing layers 22 and 24, respectively, are subjected to substantially all of the wearing forces caused by the grinding of the materials. The base castings 14 and 16, respectively, are not designed to be subjected to any wear forces.

When the hardfacing layers 22 and 24, respectively, have worn down to an unsuitable depth, the hardfacing layers 22 and 24, are reapplied by the welding process as herein before described.

The bimetal grinding rings of the present invention are applicable in all applications where crushing is required. The present invention is highly applicable to coal crushing apparatus as are typically used in electric power stations.

Modifications and variations such as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

The claims defining the invention are as follows:

1. A bimetal grinding ring which includes a base casting material which is made of a first metal composition and includes a recess and a hardfacing layer made of a second metal composition which is arcuate in shape and is located in the recess, the hardfacing layer being rebuildable over the service life of the grinding ring.

2. A bimetal grinding ring in accordance with claim 1, wherein the base casting material is made of cast white iron material.

3. A bimetal grinding ring in accordance with claim 2, wherein the cast white iron material has a hardness of 200 to 600 HB.

4. A bimetal grinding ring in accordance with claim 2 or 3, wherein the cast white iron material has a composition which includes:

(a) 2.3 to 3.0 percent by weight carbon;
(b) 0 to 1.0 percent by weight silicon;
(c) 0.5 to 1.5 percent by weight manganese;
(d) 23 to 30 percent by weight chromium;
(e) 0 to 1.2 percent by weight copper;
(f) 0 to 1.5 percent by weight molybdenum; and
(g) 0 to 1.0 percent by weight nickel.

5. A bimetal grinding ring in accordance with claim 1, wherein the base casting material is made of cast steel material.

6. A bimetal grinding ring in accordance with claim 5, wherein the cast steel material has a hardness of 200 to 450 HB.

7. A bimetal grinding ring in accordance with claim 5 or 6, wherein the cast steel material has a composition which includes:

(a) 0.25 to 2.0 percent by weight carbon;
(b) 0.4 to 1.8 percent by weight manganese;
(c) 0 to 2.0 percent by weight chromium;
(d) 0 to 0.5 percent by weight molybdenum
(e) 0.15 to 0.8 percent by weight silicon;
(f) 0 to 2.5 percent by weight nickel;
(g) 0 to 0.04 percent by weight sulphur; and
(h) 0 to 0.03 percent by weight phosphorous.

8. A bimetal grinding ring in accordance with claim 7, wherein the cast steel material composition also includes vanadium, titanium or tungsten.

9. A bimetal grinding ring in accordance with any one of the preceding claims, wherein the hardfacing layer has a composition that includes:

(a) 14 to 35 percent by weight chromium;
(b) 1.8 to 7.5 percent by weight carbon;
(c) 0 to 4 percent by weight manganese;
(d) 0 to 1.5 percent by weight silicon; and

the balance being iron.

10. A bimetal grinding ring in accordance with claim 9, wherein the hardfacing layer

composition also includes niobium, vanadium, titanium and molybdenum.

11. A bimetal grinding ring in accordance with claim 9 or 10, wherein the hardfacing layer composition also includes a microstructure of 50 to 75 percent by weight primary chromium carbides and 20 to 30 percent of eutectic/secondary carbides.

12. A bimetal grinding ring in accordance with any one of the preceding claims, wherein the hardfacing layer is applied to the recess of the base casting material by welding.

13. A method of production of a bimetal grinding ring wherein a first metal composition is cast into a base shape forming a base cast including a recess and subsequently a hardfacing layer made of a second metal composition which is arcuate in shape is applied to the recess, the hardfacing layer of the grinding ring being rebuildable over the service life of the grinding ring.

14. A method of production of a bimetal grinding ring in accordance with claim 13, wherein the hardfacing layer is applied and reapplied, when necessary, to the base casting by way of welding.

15. A bimetal grinding ring substantially as herein before described with reference to any one of the accompanying examples or drawings.

16. A method of production of a bimetal grinding ring substantially as herein before described with reference to any one of the accompanying examples or drawings.

DATED APRIL 11 1996

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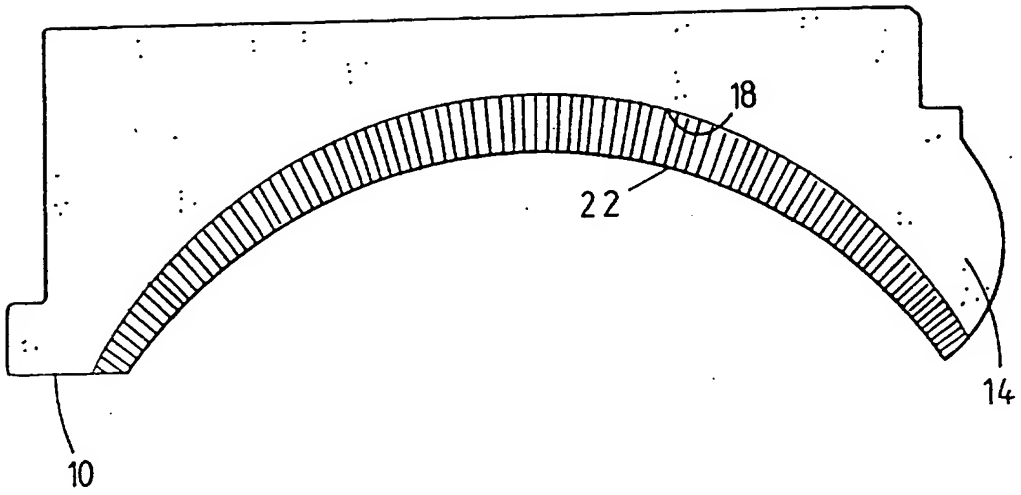

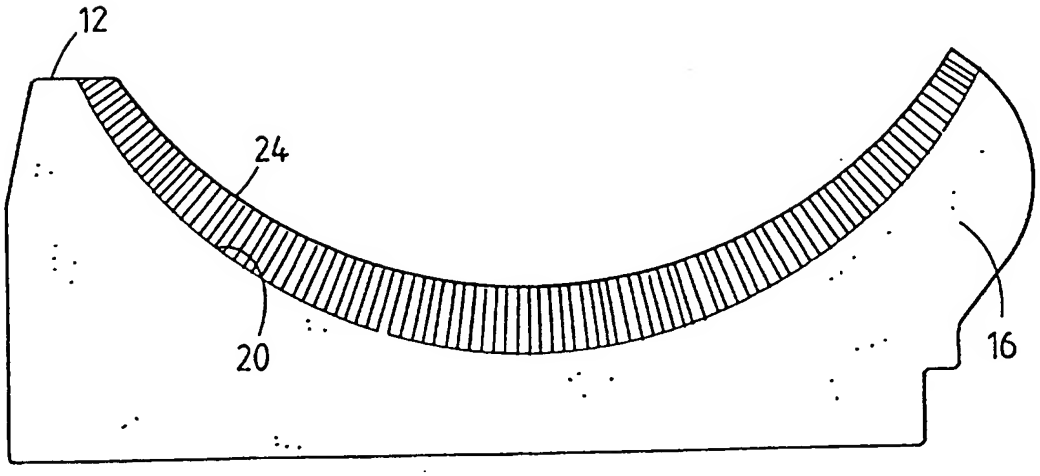

FIG.1

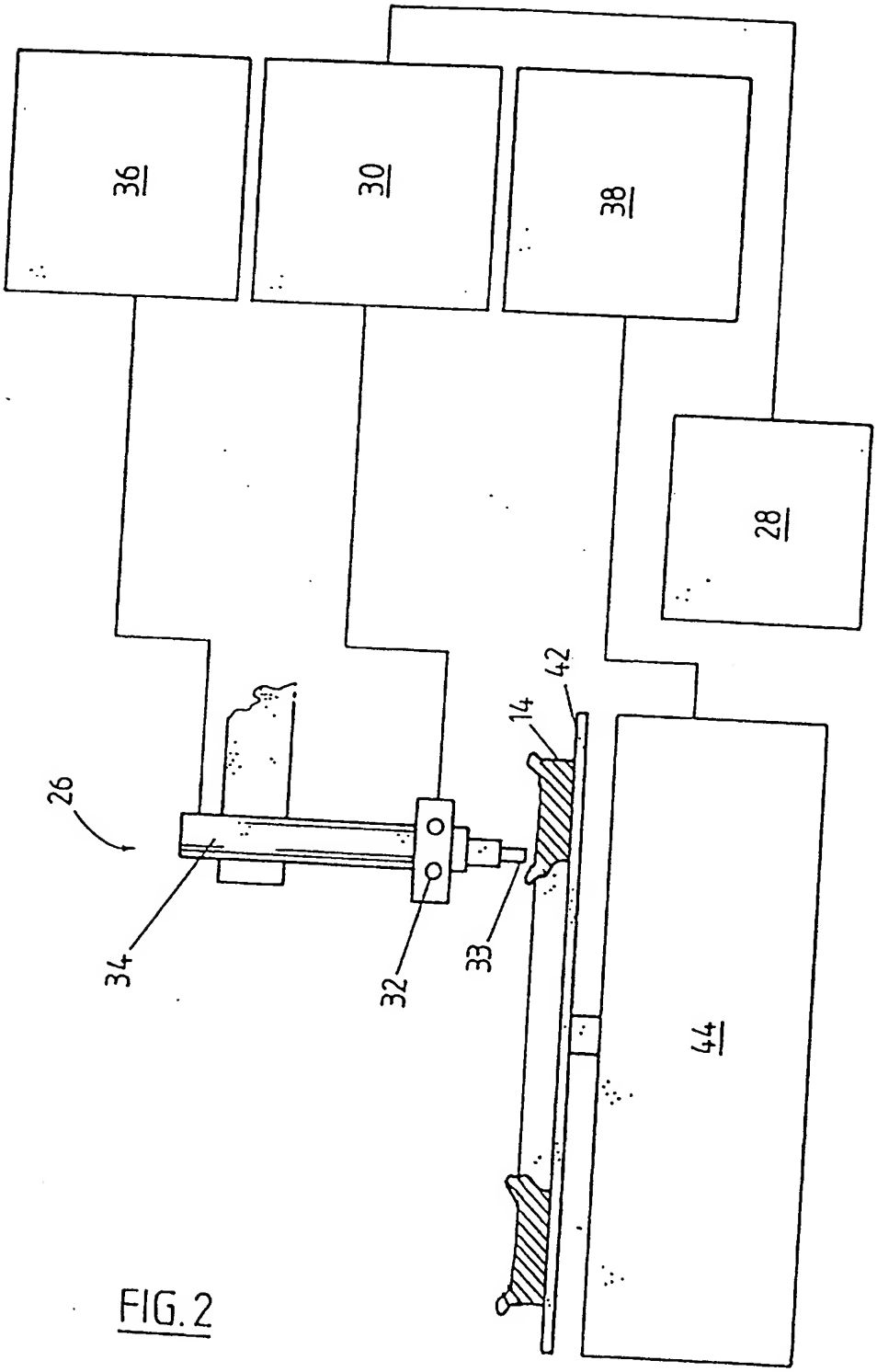

FIG. 2